

Incessant Building Collapse in Nigeria: A Framework for Post-Development Management Control

*Olayinka C. Oloke¹, Abiodun S. Oni¹, Ayodeji Ogunde², Opeyemi Josuha² and Daniel O. Babalola³

1. Department of Estate Management, College of Science and Technology, Covenant University, Km 10, Idiroko Road, Canaanland, Ota, Ogun State, Nigeria
2. Department of Building Technology, College of Science and Technology, Covenant University, Km 10, Idiroko Road, Canaanland, Ota, Ogun State, Nigeria
3. Department of Architecture, College of Science and Technology, Covenant University, Km 10, Idiroko Road, Canaanland, Ota, Ogun State, Nigeria

Abstract

This study investigates post-development management approach of properties and how it could be improved to stem the tide of building collapse in Nigeria. Extant literatures were reviewed and primary data collected with the use of structured questionnaires administered on occupants of one hundred and fifty residential and seventy-five commercial properties across Lagos State, Nigeria. Data was analysed with basic descriptive tools such as frequency, percentage, Likert scale and weighted mean score. Findings reveal abuse of property management functions by property owners and non-professionals alike in the management of various properties. Findings also show a high level of dissatisfaction with the services provided mostly by the non-professionals and that integrity assessment is rarely carried out by the professionals and non-professionals alike. The study therefore recommends that post development property management services become an exclusive preserve of professional property managers. The study further recommends that properties must be subjected to mandatory integrity assessment and subsequently, recommended for similar exercise based on the report of routine management inspection. The proposed framework for carrying out the structural integrity assessment and appropriate recommendations for the outcome of routine inspection or integrity assessment is a key contribution of this study to existing literatures on building collapse in the country.

Keywords: Building collapse, Post-Development, Property Management, Framework, Structural Integrity

1. Introduction

The hazard of building collapse in Nigeria is not abating, restricted or selective and has led stakeholders into an unending search for solution. A survey of incidence of building collapse reveals that occupied buildings are more affected than those under construction or newly completed. According to Ayedun, Durodola and Akinjare, (2012), out of the fifty-six cases of building collapse surveyed, only 4% were under construction while the remaining 96% were in use before the failure occurred. Chendo and Obi, (2015) listed ten cases of building collapse in Nigeria between 1974 and 2013 of which 40% were under construction or uncompleted while the remaining 60% were already in use. Ebehikhalu and Dawam (2014) made a comprehensive list of one hundred and thirty-nine cases of building collapse in Nigeria between 1974 and 2012. The study showed that 12% were under construction, 5% were uncompleted, 12% were unidentified while the remaining 71% were already occupied for the various purposes ranging from residential, educational, religious, administrative, commercial and hospitality facilities. Fagbenle and Oluwunmi (2010) listing sixty-one cases of building collapse in Nigeria between 1974 and 2010 revealed that 20% were under construction, 6% uncompleted while 74% were already in use. Windapo and Rotimi (2012) also surveyed cases of building collapse in Nigeria between 1974 and 2010 and came up with ninety-one cases. Out of this figure, 19% are under construction, 6% are uncompleted, 1% is fence wall while the remaining 67 (74%) were in use. This invariably implies that building collapse is more rampant among existing and occupied buildings than those under construction.

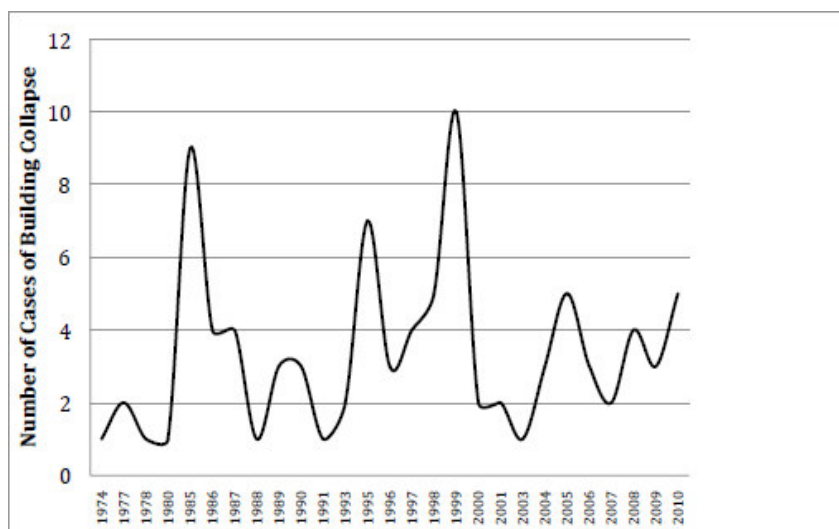
The painful destruction of personal properties and loss of lives that accompany the collapse could have been significantly reduced if the maintenance steps taken had included mandatory, periodic or conditional structural integrity assessment. Interestingly, many of the causes of building collapse are attributed to structural defect, bad design, violation of building codes, use of substandard construction materials, poor workmanship and corruption. In fact, Ayinnuola and Olalusi (2004) specifically stated that building failure in Nigeria is attributed to 50% design fault, 40% construction fault and 10% product failure. Ede (2010) and Olagunju (2011) emphasized the

importance of post-construction maintenance of building and that lack of proper maintenance culture contributes to the crisis of building collapse in Nigeria. Also identifying lack of proper maintenance as a cause of building collapse include Fagbenle and Oluwunmi 2010, Olagunju, Aremu and Oladele (2013) and Babalola (2015). Given that 60% and above of cases of building collapse across the country involve buildings that are already in use, maintenance approach cannot be overlooked and the significance of structural integrity test at before and during the use of the property cannot be over-emphasized. Structural integrity assessment is expected to identify the problem before it degenerates and recommend necessary action to prevent the losses.

2.0 Trend, Causes and Consequences of Building Collapse in Nigeria

The consequences of building collapse cannot be underestimated. A bungalow that collapse on the occupant cannot be regarded as a small loss neither will a multi-storey building that collapse with no human casualty be regarded as no loss. In fact, Ayedun, Durodola and Akinjare, (2012) submitted that owners and stakeholders in failed structure often die of high blood pressure. This is why every case of building collapse generates serious reactions from the public and that new incidence easily assume cumulative case thereby making it difficult to expressly admit an increasing or declining trend of occurrence of building failure over the years. Moreso that the loss is estimated based on the prevailing economic condition at the time of the incidence. However, according to Windapo and Rotimi (2012), there were over 112 cases of building collapse in Lagos State alone between December 1978 and April 2008. The authors, using data obtained from existing studies of Chinnokwu (2000), Windapo (2006) and Fagbenle and Oluwunmi (2010), presented a graphical depiction of incidences of building collapse in Nigeria between 1974 and 2010. This is presented in Figure 1. The graph revealed spikes in the reported cases of building collapse in Nigeria in 1985, 1995, 1999 and 2005 as well as an upward trend in the number of cases in 2010 (Windapo and Rotimi, 2012). Corroborating this trend, The Punch of March 11th, 2016 stated that there has been a spike in the number of building collapses in the country with over 20 cases reported over the last ten years.

Olagunju, Aremu and Ogundele (2013) highlight causes of building collapse thus; bad design, faulty construction, poor quality of materials and construction methods, foundation failure, fire outbreak, natural phenomenon and inadequate maintenance. Windapo and Rotimi (2012), further listed structural failure, poor workmanship, carelessness, excessive loading, illegal conversion, hasty construction, obstruction of water course as other causes. Fakere, Fadairo and Fakere (2012) also identified different causes of building failure. These include inadequate preliminary works, adoption of wrong foundation, poor concrete mix ratio, improper walling, lack of approved structural design, poor building material specification, ineffective supervision, lack of quality maintenance, fire disaster, illegal conversion and climate or natural phenomenon.



Source: Windapo and Rotimi (2012)

Figure I: Cases of Building Collapse in Nigeria between 1974 and 2010

Consequences of building collapse include loss of physical properties, destruction of movable properties, injury

and loss of life. Beyond this, building collapse always has far reaching economic, financial, psychological and sociological implications. Resources like capital, time, materials and labour inputs are wasted when building collapses. Investment ideas are frustrated and those who have a stake in it become temporarily or permanently destabilized or frustrated Ede (2010). Furthermore, the collapse may lead to bankruptcy where there is no alternative plan to recover the capital. Also the loss of job with its far-reaching effect on the people and financial pressure it caused on occupants that got injured or lost their belongings to the collapse. Decapitation, injuries and death are fatalities recorded in building collapse which cannot be estimated, replaced or restored. The shock, trauma and anxiety experienced by escapees, witnesses and rescue agents in the aftermath of a building collapse are better imagined. Ede (2010) summarizing the impact stated that each case of building collapse carries along with it tremendous effects that cannot be easily forgotten by the victims. Presented in Table 1 are cases of building collapse and possible cause in Nigeria between 1996 and 2016.

Table 1: Cases of Building Collapse in Nigeria between 1996 and 2016

S/ No.	Property Description	Location	Status	Date of collapse	Possible Cause	Casualty
1	A Storey building (Church building)	Olowokere Str. Oshodi, Lagos	Under construction	May, 1996	Structural failure	7
2	6-Storey classroom building	Ijagbemi Str. Pedro, Lagos	Under construction	October, 1996	Poor workmanship, structural failure	1
3	Residential building	Adedayo Adeniran Str. Amukoko, Lagos	In use	March, 1997	undecided	Nil
4	2-Storey commercial building	Amu Street, Mushin, Lagos	In use	June, 1997	Substandard materials, Structural failure	Nil
5	Duplex building	Gwarimpa Area, Abuja	In use	1998	Structural failure	2
6	3-Storey residential building	Ibadan, Oyo State	In use	1998	Faulty design, poor supervision	Several people
7	4-Storey Church building	Akure, Ondo State	Under construction	October 1, 1998	Structural failure, poor supervision	8
8	2-Storey residential building	Funbi Street, Abeokuta, Ogun State	In use	November, 1998	Use of poor material, structural failure	Nil
9	3-Storey residential building	Ojuelegba, Lagos	In use	April, 1999	Carelessness, substandard materials	4
10	3-Storey building	New Oko-Oba Agege, Lagos	In use	June, 1999	Structural failure	None
11	3-Storey residential building	Iju-Isaga, Lagos	In use	August, 1999	Structural failure, Rainstorm	35
12	2-Storey residential building	Dawodu Street, Ifo, Ogun State	In use	October, 1999	Rainstorm	20
13	A Storey residential building	Adeola Odeku, Lagos	In use	1999	Rainstorm	N/A
14	Residential Storey building	Idi-Oro Mushin, Lagos	In use	2000	Faulty design, carelessness	N/A
15	3-Storey residential building	Eleganza Estate, Ajah, Lagos State	In use	April, 2000	Incompetence, structural failure	5
16	St. Dennis Catholic Church building	Bariga, Lagos	In use	2000	Structural failure	3
17	State High School building	Alimosho, Lagos	In use	2000	Crowd pressure, overloading	1 death 2 injured
18	Building on 10/12, Suenu Str, Lagos	Lagos Island, Lagos	In use	2000	Deteriorated slab	2
19	Building at Isako	Lagos State	In use	2000	Structural failure	5

	village, off Lekki-Epe Express							
20	2-Storey building	mosque	Buhari Street, Mushin, Lagos	In use	April, 2001	Unauthorized conversion	7	
21	A Storey building	residential	Iwoye-Ijesha, Osun State	Under construction	2001	Structural failure, use of quacks for supervision	7	
22	2-Storey building	residential	10, Elias Street, Lagos	In use	2004	Dilapidated structure	N/A	
23	Building on 3 floors		Makinde str. Ebute-Meta, Lagos	In use	2004	Not disclosed	N/A	
24	Building on 2 floors		Solola str. Agege, Lagos	In use	2004	Not disclosed	N/A	
25	Commercial building on 2 floors		Market str. Somolu Lagos	In use	2005	Not disclosed	N/A	
26	3-Floor building	commercial	3, Princess str. Lagos	In use	July, 2005	Not disclosed	1	
27	Commercial building on 4 floors		Mushin, Lagos	In use	2005	Not disclosed	1	
28	4-Floor commercial building	residential/	53, Cemetery Rd, Amukoko, Lagos	In use	January, 2006	Ignorance, greedy landlord	7	
29	21-Storey Bank of Industry building	Bank of	Broad str. Lagos Island, Lagos State	In use	March, 2006	Aftermath of fire, heavy wind and rain	2 dead 23 injured	
30	4-Storey Block of 36 Flats known as “Titanic” Building		Ebute Meta, Lagos	In use	July, 2006	Faulty construction	28	
31	2-Floor building	school	Ikpoba-Okha LG, Edo State	In use	April, 2006	undisclosed	2	
32	3-Floor housing building	Building offices and church	Abuja	In use	June, 2006	undecided	Nil	
33	Multi-Storey commercial and Residential building		Ebute Meta, Lagos	In use	2007	Unauthorized conversion, poor supervision, use of poor quality materials	Several people	
34	Multi-Storey building		Kano	In use	2007	Faulty design, structural failure	Several people	
35	Building used as nursery and primary school		Olomi Area, Ibadan, Oyo State	In use	March, 2008	Use of poor materials, carelessness	13	
36	5-Storey complex	shopping	Wuse Area, Abuja	Under construction	August, 2008	Structural failure, incompetence, bad workmanship	2 injured, 100 trapped	
37	2-Storey building	residential	Asero, Abeokuta, Ogun State	Under construction	August, 2008	Violates planning approval, substandard materials	2	
38	6-Storey Teaching Hospital Complex	LAUTECH Hospital	Ogbomoso, Oyo State	Under construction	February, 2009	Use of substandard material, poor workmanship/supervision	5	
39	A Fence wall		Aghaji Crescent, GRA Enugu	In use	August, 2009	No proper drainage	1	
40	Uncompleted building		Oke Padre Str.	Un-	October,	Substandard	3 dead,	

			Ita-morin Abeokuta	completed	2009	materials, hasty	11
41	Building under construction		Isopakodowo str. Cairo, Oshodi, Lagos	Under construction	April, 2010	Use of substandard materials	4 death, 12 injured
42	Uncompleted Storey Building		Adenike Street, Off New Market, Oniru Estate, Lagos	Un-completed	June 2010	Substandard materials, non-compliance with approved building plans and weak structure	1 dead, 2 injured
43	Uncompleted 3-Storey Building		Ikole street, Area 11, Abuja	Un-completed	August, 2010	Undisclosed	5 dead 40 trapped
44	4-storey Building		24, Alli Street, Victoria Island, Lagos	In use	September 2010	Structural Defects/ overloading	3
45	2-Storey Zenith Bank Building		Mararaba, Abuja	In use	2011	N/A	N/A
46	4-Storey Hospital Building		Pape, Abuja	Not ascertained	2011	N/A	N/A
47	5-Storey Office Complex with a pent house		11, Aderibigbe Str. Maryland, Lagos	In use	2011	Structural failure, gross serviceability limit violation	Nil
48	5-Storey Hotel building		Adenubi Close, Ikeja, Lagos	In use	2011	N/A	N/A
49	3-Storey Block of Flats		16 Nnobi str. Enugu, Enugu State	In use	2012	Structural defects	N/A
50	One-Storey residential building		Awka, Anambra State, Nigeria	Un-completed	2012	Defective materials	N/A
51	3-storey Block of Flats in a water logged area of Owerri.		Owerri, Imo State, Nigeria	Un-completed	2012	Flooding	N/A
52	Four-storey Block of Flats at Agbama Estate, Umuahia		Agbama Estate Umuahia, Abia State, Nigeria	Under construction	2012	Non-adherence to building Regulation that permits only 2 floors in the area.	Undisclosed number of squatters perished
53	Four-storey commercial Building collapsed during a downpour		Abanye Str. Onitsha, Anambra State Nigeria	In use	2013	Heavy Rainfall flooding	N/A
54	2-Storey School building		Bukuru, Jos South Local Government	In use	September, 2013	Structural failure, violation of original approved plan	10
55	3-Storey building		Oloto Str. Ebute Meta, Lagos	In use	July, 2013	Dilapidated structure	7 dead
	Old 3-Storey building		House No. 12, Hadeja Road, Kaduna	In use	July, 2013	Old and dilapidated	3 dead
56	6-Storey Guest house building		Ikotun Egbe, Lagos	In use	September, 2014	Structural failure	116 dead, 100 injured
57	3-Storey building		Ebute Meta, Lagos	In use	July, 2015	Weak Structure	Nil

58	Residential Building of Senior Politician	Dolphin Estate, Ikoyi, Lagos	In use	July, 2015	Gas Explosion	3 injured
59	5-Storey building	Lekki Gardens, Lekki Phase 1, Lagos State	Under construction	March, 2016	Violation of approved number of floors	34 dead
60	4-Storey shopping plaza	Itoku Market, Abeokuta, Ogun State	Under construction	May, 2016	Under investigation	1 dead

2.1 Post Development Management

Post development management is a three pronged task involving lease or tenancy administration, space management and building maintenance. The scope of post construction responsibilities of a property manager is presented in the Table 2.

2.2 Structural Integrity Assessment

Structural integrity according to Alam (2005) is the science and technology of determining between safety and disaster while structural integrity assessment is a process of determining how reliable an existing structure is able to carry current and future loads and fulfill the tasks for a given time period (Rucker et al 2006). Alam further emphasized that proper evaluation of structural integrity and remaining life of structures is important to ensure public safety, environmental protection and economic consideration of building new structures, maintaining and rehabilitating existing ones. Structural integrity assessment is an exercise that covers a wide range of task depending on the infrastructure involved. This notwithstanding, Olaniyi, Ogunseye and Lagunju (2014) stated that consistent inspections must be carried out on most structures to ensure that they do possess adequate structural integrity. Structural integrity is conduct to assess the state of all critical areas and identify the weak point for necessary action. An aspect of structural integrity assessment is non-destructive test (NDT) which according to Olaniyi, Ogunseye and Lagunju (2014) provide a relatively swift and inexpensive means to establish whether a structure is still in a serviceable condition or not without impairing parts or the entire structure. Non-destructive test does not destroy the object and make use of different technologies to analyze materials for inherent flaws or damage from use. Ede (2008) suggested that visual inspection may be combined with Non-Destructive Testing techniques to assess internal defects and make maintenance meaningful.

Table 2: Scope of Post-Construction Responsibilities of a Property Manager

Space Management	Lease Administration	Property Maintenance
Statutory space maintenance e.g. setback, right of way etc.	Tenancy agreement execution	Periodic structural integrity test
space configuration, allocation, organization	Rent collection	Electrical services efficiency test
Common space maintenance	Finance and budget planning	Mechanical services efficiency test
Advert space management	Caution fee administration	Ceiling and roofing integrity test
Parking space administration	Service charge administration	Cracks and dilapidation assessment
Muster point management	Arbitration	Wall and floor finishes condition assessment
Space capacity re-evaluation	Insurance payment	Fixtures and fittings' fitness assessment
Space use regulation	Utilities bill payment	Driveway and walkway condition assessment
Greens and blues Management	Development and property tax payment	Daily cleaning, drainages clearing and waste disposal
	Land use charge administration	Fence wall and outbuilding integrity test
	Routine management inspection	Waterworks efficiency test and quality assessment
	Security provision	Power generator efficiency test
	Records and accounting	Soak pit and bore hole condition assessment
	Service providers' contract management	Gas pipe and duct integrity/efficiency test
		Health, safety devices and environment condition assessment

3.0 Empirical Studies

Ede (2010) examined the trend and casualty of building collapse in Nigeria between 2000 and 2010 by analysing historical data on building collapse in Nigeria in the last 3 decades and on field observations. Simple linear regression analysis was used for the analysis of the data as to hypothesize a probabilistic relationship between the rate of casualties and the height of the collapsed building. Pearson product moment correlation coefficient was calculated to further test the extent of linear relationship between the rate casualties. It was found that apart from the general causes such as design flaws, ageing, material fatigue, extreme operational and environmental conditions, accidents, terrorist attacks and natural hazards, the Nigerian factor which manifest in the form of corruption, lawlessness and “Jack of all trade” mentality of various professionals in the construction industry, has gained much prominence among the factors leading to eventual collapse of building structure. The study further revealed that the number of casualty increases as the number of floor increase. The study recommends seminar and safety awareness creation for users of high rise building. Ede (2011) examined measures to reduce the high incidence of structural failures in Nigeria. The study aptly attributed causes of structure failure to flaws or lapses committed during the three basic stages of building construction which are conception-design stage, construction-supervision stage, and post construction-service stage. Aside the fact that incidence of building collapse has been on the increase, absence of standardized training programs for the craftsmen in the building industry was found to be one of the fundamental causes of defects in our structures which often culminate to collapse. The study mentioned that Visual inspection may be combined with Non-Destructive Testing techniques to assess internal defects and make maintenance meaningful.

Ehoirobo and Okovido (2013) undertook an assessment of Structural Integrity of an In-service School Building at Risk Using Geotechnical Measurement Parameters in Benin City, Nigeria. Visual inspection of the building concerned was carried out to reveal the state of dilapidation while soil samples were also collected from different locations around the buildings for laboratory analysis to determine if the foundation were responsible for the problems observed. Dutch Cone Penetrometer Tests (CPT) were also conducted. The results of the tests showed that the depositional pattern at the location ranged from clay to sandy soils. Particle size distribution results showed that the clay content vary from between 40 and 60%. The results from the Cone Penetrometer Tests indicate that the soil consolidates from a depth of 4m below ground level. However, the foundation depth of the building is 2.1m below ground floor. This indicates that the foundation of the building is located at 2m above the foundation soils. From the studies, it was observed that the isolated foundation footings are conducting relatively high bearing pressure in a consolidating soil resulting in high differential settlement. In order to remedy the situation, a raft foundation slab is proposed to replace the existing ground floor of the building. This study emphasized the need for structural integrity assessment for the case study to ascertain the cause of cracks and settlement observed on the building. The study however did not elaborate on how to detect other causes such as use of substandard materials and failed to incorporate structural integrity assessment into routine management inspection.

Babalola (2015) examined Building Collapse, Causes and Policy Direction in Nigeria. The study identified several cases and causes of building collapse from 1970 till date. The study reviewed several past studies that identified causes of building collapse to include sub-standard materials, adding load that differ from the original design and non-compliance on the professional ethics, faulty design, construction site fault, faulty execution, poor maintenance, lapses in supervision and poor workmanship. The study recommended that government policies guiding building construction in the country should be reviewed and properly implemented. The failed to look at post development management of property in an elaborate manner. Chendo and Obi (2015) in a similar study examined the causes, effect, consequences and remedies to building collapse in Nigeria. The Authors identified cases of building collapse in Nigeria and other countries as far back as 226AD till recent years across the Globe. No adherence of building plans, lack of government permits, corruption, engagement of inexperienced personnel, incompetent contractors, illegal conversion, undue interference, foundation failure, fire outbreak etc. as well as other factors earlier listed. The study outlines different measures to curb the menace amongst which is the observance urban and regional planning decree 88, of 1992 and as in section 13 of National Building Code 2006. Similar studies on the cases, causes and remedies to building collapse are Ebehikhalu and Dawam (2014), Fagbenle and Oluwunmi, (2010), Fakere A.A. Fadare G. and Fakere R.A. (2012) listed in addition to the causes of building collapse already identified, inadequate preliminary work, adoption of wrong foundation, poor concrete mix, improper walling and climate.

Arising from the previous studies on building collapse in Nigeria, it was observed that none of the study placed emphasis or examined in detail the post development approach to property management and how this could control building collapse. Ede (2011) mentioned proper post construction service and the need for physical inspection to be combined with non-destructive test, while Ehoirobo and Okovido (2013) described the use of

structural integrity test to assess the strength and suitability or otherwise of the subject property to continue to serve the purpose, neither of these study actually outline how the structural integrity test combine with physical inspection in such a way that flaws committed during design and construction stages are detected early. It was further observed that neither of the studies made highlighted the possible outcome of the structural integrity assessment and make suitable recommendation based on the result. This study therefore contributed to researches on building collapse by recommending a framework that incorporate structural integrity test (non-destructive test) into routine management inspection of property managers. The framework further suggest schedules for structural integrity assessment of buildings which would detect flaws committed during design and construction stages as well as those that the property was exposed to during the occupation stage either naturally, wear and tear or passage of time. This framework also identifies parties and their distinct roles in implementing the programme and make appropriate recommendation for outcome of each routine inspection or structural integrity assessment carried out.

4.0 Research Methods

Lagos State has the highest number of building collapse in the country. Table 2 reveals that thirty-five (58.3%) out of the sixty cases between 1996 and 2016 occurred in Lagos State alone. Mba (2014) citing Windapo and Rotimi (2012) showed that Lagos State alone account for 51.6% of building collapse in Nigeria between 1974 and 2010 while other States in South-West Nigeria account for 18.7%. Abuja and States in the remaining geo-political zones account for the rest. Based on its strategic economic importance, population density, cases of building collapse and vatality, Lagos State was selected. Primary data were collected with structured questionnaires administered on occupants of 225 residential and commercial buildings randomly selected across the State. Three different neighbourhoods were targeted by the study, depicting the high class, middle class and low class neighbourhoods. Seventy-five questionnaires were taken to each of the neighbourhoods. Two-third was distributed to occupants of residential properties and one-third to users of commercial properties. Data were analysed in percentages, five-point Likert scale and mean score analysis. The mean score of was subsequently assessed on an adapted scale devised by Morenikeji (2006) for interpreting results of Likert scale analysis. The questionnaire was used to elicit data on the approach to post-construction property management and the level of satisfaction of occupants with the management services they got from the service providers. Consequently, a framework was proposed for improving the practice of post-development property management in order to curb the frequent collapse of building.

4.0 Results and Discussion

4.1 Response Rate Analysis

A total of 150 administered to occupants of residential properties and 75 to users of commercial properties across the high, middle and low class neighbourhoods. The rate of response is presented in Table 3. The analysis showed an overall average response rate of 88%. This rate is deemed sufficient for subsequent analysis.

Table 3: Questionnaire Administration and Rate of Response

Respondents	Property Type	No. Distr.	High Class	Middle Class	Low Class	Total	Rate of Response
Property Owners	Residential	150	39	43	46	128	85%
	Commercial	75	21	24	25	70	93%
	Sub-total	225	60	67	71	198	88%

4.2 Socio-economic Characteristics of Respondents

The socio-economic characteristics of respondents are presented in Table 4. The analysis revealed among others that majority of the respondents are male (62%) and that 79% are 31 years old and above. This suggests that these are active working class set of people. Further, with 72% having at least first degree, the respondents are literate enough to understand and provide reliable responses. In addition, the tenure of the occupants also showed that 76% are tenants and 24% are owners. The predominance of tenants attest to the high expectation of the performance of the post development services providers. The respondent group was purposely selected because, being the occupant/user of the building, their perspective of performance of their management service provider is deemed reliable. Furthermore, the analysis showed that 18% of the properties are owner occupied, 10% are co-occupied while the remaining 72% are fully tenanted. This implies daily usage pressure on the facility which necessitates prompt and adequate response from the service provider in order to prolong the life of the property. Finally, respondents, who are occupants of the sampled property, were requested to indicate the post development service providers of the building. Analysis showed that 74% of the properties are actually managed by non-professionals such as the owner, agent/caretaker and in some extreme cases, the tenant themselves. It was also found that many property owners handed over the management of their properties to non-professional agents. The quality of the property manager will determine the quality of management services received by the

occupants as this will show in their approach and handling of the various challenges emanating from the use of the property.

4.3 Scope of Post Development Management

The scope of post-development management services as well as the level of satisfaction derived by the occupants with the services is provided in Table 4. Respondents were requested the service received from their post development management service providers and response were expressed in percentage. The level of satisfaction is assessed on a 5-Point Likert scale and the mean score determined. The mean score is interpreted by adapting a tool devised by Morenikeji (2006) stipulating the following cut-off points for the scales

- 1 – 1.5 Not Satisfied
- 1.51 – 2.49 Less Satisfied
- 2.50 – 3.49 Unsure
- 3.50 – 4.49 Satisfied
- 4.5 – 5.0 Very Satisfied

Table 4: Socio-economic characteristics of respondents

Characters	Variables	Frequency	Percentage (%)
Sex	Male	123	62
	Female	75	38
	Total	198	100
Age	Below 20	-	-
	21 – 30	41	21
	31 – 40	85	43
	Above 41	72	36
	Total	198	100
Education	Secondary	-	-
	Diploma	56	28
	First Degree	79	40
	Second Degree	63	32
	Total	198	100
Tenure	Tenant	151	76
	Owner	47	24
	Licensee	-	-
	Total	198	100
Accommodation occupation status	Owner-occupied	36	18
	Co-occupied	19	10
	Fully Tenanted	143	72
	Total	198	100
Post-Development Management	Property Owner	41	21
	Tenants	15	8
Services Provider	Agents	89	45
	Professional	53	26
	Estate Manager	-	-
	Total	198	100

Table 5: Scope and level of satisfaction with the post development management services

Scope of post-development management services	Owner			Tenants			Agents			Professional Property Managers		
	Yes	No	MS	Yes	No	MS	Yes	No	MS	Yes	No	MS
Space organization and management	32	68	2.6	0	0	1.3	35	65	1.7	59	41	3.8
Lease agreement	100	0	2.7	0	0	-	73	27	3.6	100	0	4.3
Service charge administration	29	71	1.9	0	0	-	46	54	3.2	69	21	3.6
Security provision	31	69	2.4	0	0	-	47	53	2.9	61	39	3.5
Insurance	21	79	2.7	0	0	-	33	67	2.8	59	41	2.8
Mandatory, periodic or conditional structural integrity assessment	0	0	-	0	0	-	0	0	-	0	0	-
Mechanical and electrical services maintenance	28	72	2.8	61	39	2.7	78	22	3.6	90	10	3.9
Regular maintenance of finishes	32	68	3.2	0	0	-	41	59	3.3	60	40	3.4
Maintenance of fixtures and fittings	32	68	3.2	0	0	-	53	47	3.6	77	23	3.8
Maintenance of driveway and walkway	28	72	2.4	0	0	-	57	43	3.4	83	17	3.6
Drainage clearance and waste management	92	10	3.6	63	37	2.3	53	47	3.5	87	13	3.8
Maintenance of fence wall and outbuildings	56	46	3.4	12	88	1.3	34	66	3.3	73	27	3.5
Maintenance of independent water supply system	50	50	3.5	10	90	2.9	45	55	3.2	61	39	3.7
Maintenance of independent power supply system	46	64	3.6	12	88	2.9	59	41	3.4	51	45	3.5
Condition assessment and maintenance of sewer system	74	26	3.7	23	77	3.0	69	31	3.6	83	17	3.8
Fitness assessment of pipes and ducts	12	88	3.5	0	0	-	37	63	2.3	44	56	3.9
Fitness test of health and safety devices	18	82	2.9	0	0	-	39	61	1.9	43	57	3.1
Maintenance of pool, pond and lawn	34	66	1.8	17	83	2.3	38	62	3.3	70	30	3.6
Execution of capital project on improvement works	45	55	3.6	0	0	-	35	65	2.8	60	40	3.5

Table 5 revealed that occupants do not receive adequate services from property owners as frequency of disapproval response are significantly above average. It also showed that generally, occupants are either less satisfied with most of the services provided by these owners. It is evident from the analysis that the owner does not carry out structural integrity assessment of the building prior to or during occupation. A similar but more disturbing trend was observed from the perspective of tenants who take care of the property they occupy. Most services are not provided and occupants show generally, high level of dissatisfaction. Analysis of the services of agents reveals the approval rates of their performance generally are less satisfactory. The post-development management services provided by professional property managers showed that they perform satisfactorily in providing majority of the services. It was however noted from the responses of the occupants that structural integrity assessment was covered by any of the service providers. The high rate of discontentment with the services of non-professionals could be attributed to the fact that they are not adept in providing such services.

5.0 Proposed Framework for Post-Development Management Services

Figure 2 showed the proposed framework for post development property management. The framework is a multi-party task involving activities such as structural integrity assessment, routine management and recommended remedial actions aimed at curbing the catastrophic consequences of building collapse. Thus the network of functions, factors, conditions and recommendations and the presumed relationship are explained. The framework proposed that every structure upon completion is subjected to structural integrity test prior to use and during occupation and issued certificate of fitness by the government. It further suggests that the owner

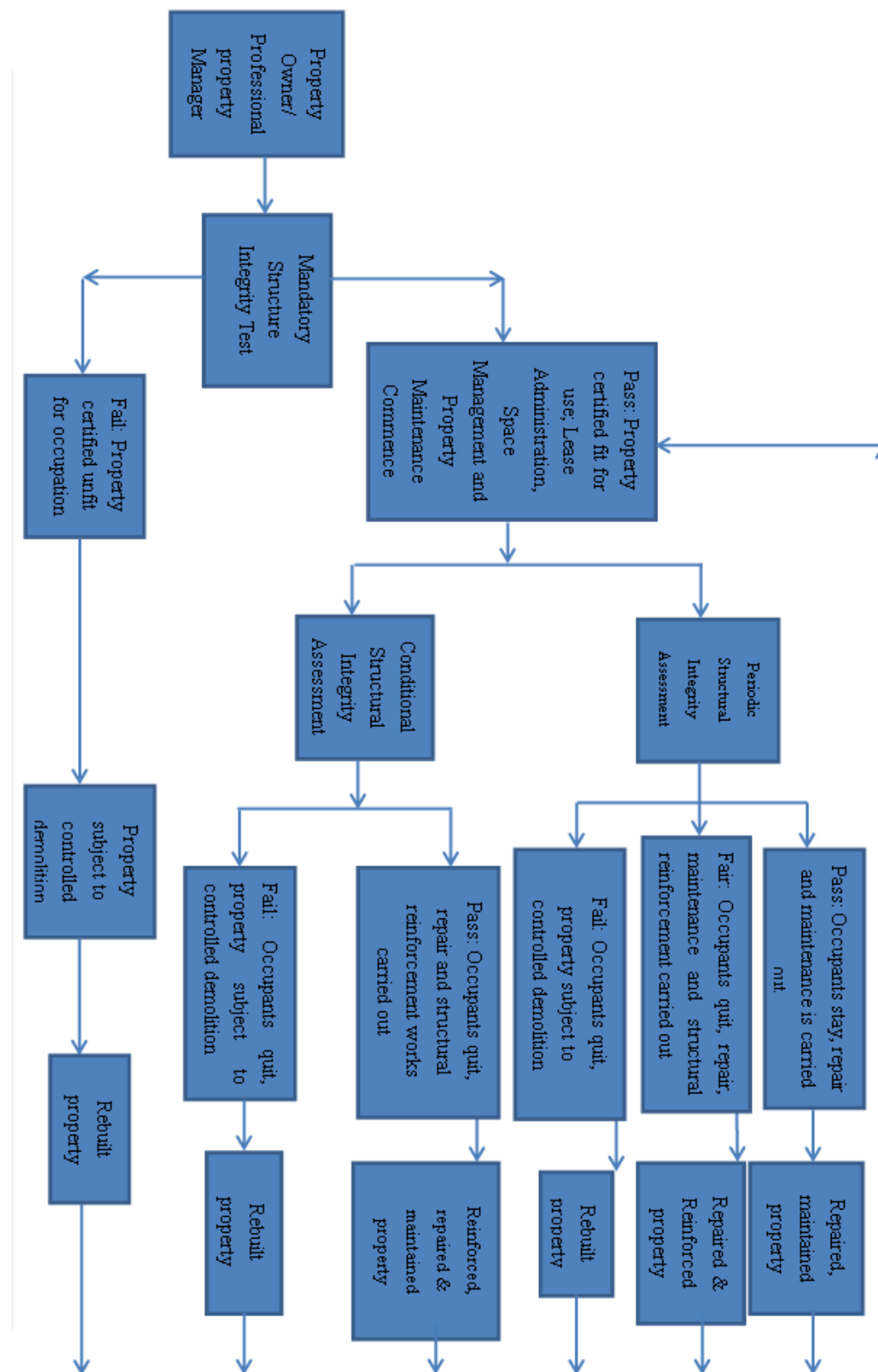
appoints professional property manager to handle the management of the property. The mandatory structural integrity assessment helps to detect those challenges that escaped design and construction stages and may activate or accelerate building collapse soon after the use commenced. These include faulty design, poor workmanship and poor supervision, use of substandard building materials, inappropriate substructure, arbitrary alteration, faulty construction and excessive loading. If it fails the test, it is certified unfit and recommended for controlled demolition and reconstruction. If it passes the test, certificate of fitness is issued for use. The professional property manager immediately commences the tasks of lease administration, space management and property maintenance.

Routine inspection is carried out to assess the impact and symptoms of passage of time, wear and tear on building structure and component's life-span. This is remedied by schedule of repair and maintenance. Notwithstanding, periodic or conditional structural integrity assessment shall be carried out (as statutory exercise) consequent upon the report of routine management inspection. Where report only shows lack of adequate maintenance, passage of time, wear and tear on building structure and component life span, the property undergo routine repair and maintenance and scheduled for periodic structural integrity assessment. Where the exercise shows alarming level of dilapidation e.g. extensive vertical or lateral cracks, excessive deflection, removal of bonds and plaster, blown roof, prolonged floor or wall dampness, settlement and any other manifestations occasioned by flooding, fire, heavy wind, faulty or damaged plumbing, overloading, overcrowding, illegal conversion/alteration, landslide, mudslide, expanding gorge/gully or sinkhole that threaten the property, then the report recommends conditional structural integrity assessment.

The periodic or conditional structural integrity assessment is carried out in collaboration with building and structural engineers appointed by the government. Where the subject property passes the periodic structural integrity assessment, maintenance is carried out without necessarily ejecting the occupants. Where the result is fair, the occupants quit and the property undergo structural reinforcement, repair and maintenance. Where the property fails the test, the occupants quit and the property recommended for controlled demolition and reconstruction. In the case of conditional structural integrity assessment, if the property passes the test, the occupants are asked to quit while the property undergo structural reinforcement, repair and maintenance. In the event of failure, the occupants quit and the property undergoes controlled demolition and reconstruction. Thus the end product of each course of action is the repaired, reinforced or reconstructed property. The repaired, reinforced or rebuilt property is then referred to the designated government agency to certify fit and approved for occupation. Once the approval is granted, the professional manager in charge commences the tasks of lease administration, space management and property maintenance and the cycle continues. Depending on the size and intensity of use, multi-storey and large structure such as stadium, theater galleria and others in this category are recommended for periodic structural integrity assessment at every five year interval while for smaller structures such as residential apartments that have already passed the initial mandatory structure integrity test could be schedule based on report and recommendation of routine management inspection.

5.0 Conclusion

Early detection and discovery of the causes of building collapse via the mandatory, periodic or conditional structural integrity assessment go a long way in preventing incessant building collapse and eliminate the attendant loss of life and other properties. This exercise is often missed out in post development property management practices and had over the years rendered property management incapable of effectively controlling or curbing the catastrophe. The mere fact that if the subject property failed the mandatory structural integrity test, it would be demolished would compel the client, the builder and the contractors to do their job right. In order to ensure implementation and compliance with the framework, the structural integrity assessment report must be backed up by law, making it a statutory requirement before and after occupation. The law must also recommend that every property, whether private or public property and for any purpose must be managed by professional property manager, that is, the estate surveyors and valuers.



References

- Alam, M. S. (2005). Structural Integrity and Fatigue Crack Propagation Life Assessment of Welded and Weld-Repaired Structures. A Ph.D Thesis Submitted to the Graduate Faculty of the Louisiana State University and Agricultural and Mechanical College in Partial Fulfillment of the Requirements for the Degree of Doctor of Philosophy in The Department of Mechanical Engineering.
- Ayedun C.A., Durodola O.D. and Akinjare O.A. (2012). An Empirical Ascertainment of the Causes of Building Failure and Collapse in Nigeria, *Mediterranean Journal of Social Sciences* 3(1) 313 - 322
- Ayininuola, G. M. and Olalusi, O. O. (2004). Assessment of Building Failures in Nigeria: Lagos and Ibadan Case Study, *African Journal of Science and Technology (AJST), Science and Engineering series*, 5(1), 73 – 78
- Ayuba, P., Olagunju, R. E. and Akande, O.K. (2012). Failure and Collapse of Buildings In Nigeria: The role of professionals and other participants in building industry, *Interdisciplinary Journal of Contemporary Research Business (IJCRB)*, 4(6), 267-1272, ISSN 2073-7122
- Babalola H. I. (2015). Building Collapse: Causes and Policy Direction in Nigeria: *International Journal of Scientific Research and Innovative Technology* 2(8),1-8
- Chendo I.G. and Obi N.I. (2015). Building Collapse in Nigeria: The Causes, Effects, Consequences and Remedies. *International Journal of Civil Engineering, Construction and Estate Management* 3(4), 41- 49
- Chinwokwu, G. (2000). The Role of Professionals in Averting Building Collapse” Proceedings of a Seminar on Building Collapse in Nigeria. The Nigeria Institute of Building, Lagos 12-28
- Ebehikhalu N and Dawam P. (2014). Spatial Analysis of Building Collapse in Nigeria: A Study of the Causes and Problems. *Journal of Economics and Sustainable Development*. 5(25), 95-108
- Ede, A.N. (2008). Structural Damage Assessment of FRP-Strengthened Reinforced Concrete Beams under Static and Fatigue Loads. (Unpublished Ph.D Thesis). Department of Innovative Engineering, Lecce, Italy: University of Salento. 189 pages
- Ede A.N. (2010). Building Collapse in Nigeria: The Trend of Casualties the Last Decade (2000 -2010). *International Journal of Civil & Environmental Engineering* 10(6), 32-38
- Ede, A.N. (2011). Measures to Reduce the High Incidence of Structural Failures in Nigeria. *Journal of Sustainable Development in Africa Vol. 13, No.1, 153 – 161*
- Ehiorobo J. O. and Okovido J. O. (2013). Assessment of the Structural Integrity of an In-service School Building at Risk Using Geotechnical Measurement Parameters. *Journal of Emerging Trends in Engineering and Applied Sciences (JETEAS)* 4(5): 763-767
- Fagbenle O. I. and Oluwunmi A.O. (2010). Building Failure and Collapse in Nigeria: The Influence of the Informal Sector *Journal of Sustainable Development* 3(4), 268 - 276
- Fakere A.A, Fadaio G. and Fakere R.A. (2012). Assessment of Building Collapse in Nigeria: A Case of Naval Building, Abuja, Nigeria. *International Journal of Engineering and Technology* 2(4),581 – 591.
- Kuye, O., (2011). *Estate Office Practice*. 2nd Edition, Published by Adro Dadar Heritage Company Limited, Lagos, Nigeria
- Mba O. A. (2014). Perception Survey of Poor Construction Supervision and Building Failures in Six Major Cities in Nigeria *British Journal of Education, Society & Behavioural Science* 4(4): 456-472,
- Morenikeji, W. (2006). *Research and Analytical Methods: For Social Scientists, Planners and Environmentalists*, Jos: Jos University Press.
- Ogunsemi, D.R. (2002). Cost Control and Quality Standard of Building Projects. In D.R. Ogunsemi (ed).

Proceedings on Building Collapse: Causes, Prevention and Remedies Ondo State, Nigeria: the Nigeria Institute of Building, 88-94

Olagunju, R.E. (2011): Development of Mathematical Models for the Maintenance of Residential Buildings in Niger State, Nigeria, Ph.D (Architecture) Thesis, Department of Architecture, Federal University of Technology, Minna, Nigeria

Olagunju R.E., Aremu S.C. and Ogundele J. (2013) Incessant Collapse of Buildings in Nigeria: An Architect's View. *Civil and Environmental Research* 3(4) 49 – 54

Olaniyi, A.O., Ogunseye O.D. and Lagunju W. (2014). Significance of Structural Integrity Assessment in the Sustenance of Nigeria's Infrastructural Development

Oyewande, B. (1992). A Research for Quality in the Construction Industry, *Builder's Magazine*, June/July Ed., Lagos.

Rucker .W, Hillie F and Rohrmann R (2006). "Guideline for the Assessment of Existing Structures" Federal Institute of Material Research and Testing (BAM) Berlin Germany SAMCO Final Report 2006.

Windapo, B. (2006). The Threat of Building Collapse on Sustainable Development in the Built Environment, Jos 9th August, 51-67

Windapo A.O and Rotimi J.O. (2012). Contemporary Issues in Building Collapse and Its Implications for Sustainable Development *Buildings: 2*, 283-299 doi:10.3390/buildings2030283